Brown Adipose Tissue

Obesity

Brown Adipose Tissue: The Magic Bullet?

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Despite the huge prevalence of obesity, the interest in the study of energy expenditure in humans has been limited in the past decades, as raising energy expenditure is a less successful approach to lose weight when compared with reducing energy intake. The rediscovery of brown adipose tissue (BAT) in humans (1) has not only boosted molecular biology research on this tissue but has also revived the interest in human energy metabolism. BAT, when activated, can burn substrates with the sole goal of producing heat and therefore can increase energy expenditure. Not unexpectedly therefore, cold exposure is generally accepted to be the strongest activator of BAT in humans, and cold exposure indeed increases nonshivering thermogenesis in humans. However, BAT is nowadays regarded as the magic metabolic bullet, and it is suggested that activation of BAT can prevent diet-induced obesity.

In this issue of *Obesity*, Peterson et al. (2) investigate whether BAT is involved in the metabolic adaptation to long-term overfeeding in humans. Only a few long-term overfeeding studies with sophisticated methodology to measure energy metabolism exist, making this a highly significant study. The important results of the study show that humans indeed show metabolic adaptation to long-term overfeeding, as sleeping energy expenditure (a major determinant of 24-hour energy expenditure, accounting for 50% to 70% of all energy expended in a day) increased 4.7% more than expected based on changes in body composition. Although 4.7% may seem small at first sight, such increases in energy expenditure may help to defend the body against excess overweight. Interestingly, the variation between individuals in this metabolic adaptation was large, suggesting that some individuals are better equipped to defend their body weight, following the mechanism proposed by Stock to regulate energy balance during overfeeding (3). Does BAT explain this variation in metabolic adaptation? According to the results of Peterson et al. (2), BAT thermal activity was unchanged upon long-term overfeeding, and BAT activity was also not related to the metabolic adaptation. As acknowledged by the authors, BAT activity was not determined by the gold standard methodology, PET-CT (4), and therefore a role for BAT activity in the metabolic adaptations to overfeeding cannot be ruled out. Regardless, this study confirms the existence of the interesting phenomenon of metabolic adaptation of energy metabolism, illustrating that the current research interest in human energy metabolism is fully justified.

What we urgently need are open-minded human translational studies to unravel the interindividual variation in human energy metabolism. Such studies should include—but not be restricted to—understanding the physiological role of BAT in regulating energy expenditure. In the end, boosting energy metabolism may be an important future strategy to prevent obesity-associated metabolic disorders, and understanding the complex nature of energy metabolism requires studies in humans (5). Experimental setups used by Peterson et al. (2) present excellent opportunities to reach those goals.

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